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RETENTION IN EDUCABLE MENTALLY RETARDED CHILDREN OF MATERIAL PRESENTED BY SIMULTANEOUS READING AND LISTENING.

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THE EFFECT OF USING SIMULTANEOUS BIMODAL INPUTS ON THE COMPREHENSION OF CONNECTED DISCOURSE FOR IMPROVING THE READING AND LISTENING SKILLS OF EDUCATIONALLY MENTALLY RETARDED CHILDREN WAS STUDIED. SUBJECTS WERE STUDENTS BETWEEN THE AGES OF 12 YEARS, 11 MONTHS AND 17 YEARS, 11 MONTHS WHOSE MEASURED INTELLIGENCE WAS BETWEEN 54 AND 86. THE STUDENTS WERE FROM A PUBLIC SPECIAL EDUCATION SCHOOL AND READ AT THE SECOND GRADE LEVEL. THERE WERE FOUR TREATMENT GROUPS--MACHINE-AUDIO-VISUAL (MAV), TEACHER-AUDIO-VISUAL (TAV), MACHINE AUDIO (MAUD), AND A CONTROL GROUP. EXPERIMENTAL MATERIALS WERE THREE 600-700 WORD PASSAGES RATED AT THE THIRD, FIFTH, AND NINTH GRADE LEVELS. A 20-ITEM MULTIPLE CHOICE TEST WAS DEVELOPED FOR EACH PASSAGE. TESTS WERE ADMINISTERED IMMEDIATELY AFTER READING A SELECTION, AFTER ONE MONTH, AND AFTER TWO MONTHS. A RELEARN INDEX WAS PROVIDED. MEAN SCORES, STANDARD DEVIATIONS, AND ANALYSIS OF VARIANCE WERE USED TO ANALYZE THE DATA. SIGNIFICANT RETENTION WAS OBVIOUS AFTER ONE MONTH. HOWEVER, SIGNIFICANT LOSSES WERE LATER DETECTED BY COMPARISON WITH INITIAL SCORES. INITIAL DIFFERENCES IN THE DIRECTION OF MAV GREATER THAN TAV GREATER THAN MAUD DID NOT HOLD UP ACROSS THE RETENTION INTERVAL. FURTHER RESULTS, CONCLUSIONS, AND REFERENCES ARE INCLUDED. THIS PAPER WAS PRESENTED AT THE INTERNATIONAL READING ASSOCIATION CONFERENCE (SEATTLE, MAY 4-6, 1967). (BK)

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Retention in Educable Mentally Retarded Children of Material Presented by Simultaneous Reading and Listening*

The American Institutes for Research has begun to develop a program of research which has as its long-term goal the investigation and improved understanding of human informational inputs, processing, and storage, and the translation of such improved understanding into both theory and practice. The research described here was part of a project which had two broad aims: (a) to study the effect of using simultaneous, bimodal (eye-ear) inputs on the comprehension of connected discourse, both in terms of assimilation and retention of content, and in terms of improvement of reading and listening skills; and (b) to consider the implications of such procedures for the instruction of that portion of the intellectual continuum commonly known as educable mentally retarded (EMR).

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The concept that bimodal presentation (simultaneous reading and listening) might facilitate information transfer and retention had its orgin in several previous studies.

In an unpublished paper, Travers (6) reported making a careful review of studies back to 1894 supposedly supporting the idea that the use of several senses simultaneously is more efficient than the use of the senses separately for the transmission of information. Nearly all of these studies concluded that simultaneous use of auditory and visual channels of information transmission is more effective than use of either alone. (These studies form much of the basis for the widespread use of audio-visual aids.) However, most of these studies were found wanting either in design or in tests of significance, and Travers and his students, e.g., Van Mondfrans, (7), researched the problem further using more careful controls. Briefly, their results cast doubt on the earlier conclusions of facilitation. Using simple rote learning of word lists of varying degrees of meaningfulness, no significant facilitating effect of eye-plus-ear transmission was found. (The influence of degree of meaningfulness was not discussed.) A further study using more rapid rates of transmission appeared to show an interference effect.

Travers maintained that these findings tied in with those of Hernandez-Peon, et al. (2), who demonstrated that the sight of a mouse by a cat resulted in a blocking of the nerve impulse produced by an audible click.

However, it should be noted that the mouse and the click, far from being identical or complementary in stimulus content, are properly thought of as competing stimuli. Thus, the Travers and Hernandez-Peon experiments are based on rather sharply different stimulus conditions, and do not necessarily support each other.

On the other side of the question, Stromer (5) trained one group of subjects extensively in listening alone, and another group in reading silently while listening to the same material presented simultaneously at rates up to 285 words per minute. Both groups were then tested on both narrative and "study" material. Those students given reading-listening training showed a significant increase in rate of reading, a slight improvement in listening comprehension, and no improvement in reading comprehension of study material. For those students given training only in listening there was no significant improvement in reading comprehension, though presumably the group did improve in listening comprehension. However, for both groups, listening to narrative material while reading it resulted in comprehension that was significantly greater than that for silent reading alone.

In an unpublished paper presented to the Annual Workshop on Reading Research (March 1964) conducted by the Committee on Diagnostic Reading Tests, R. G. Heckelman (1) reported on the use of simultaneous oral reading by teacher and student as a remedial reading training procedure.

"Children with severe handicaps in the area of reading were given a maximum of 7 1/4 hours of instruction by this method during a period of 6 weeks with a resultant average of 2.2 grade levels of growth in functional reading skill." Heckelman termed his system a "Neurological Impress Reading Method," employing visual-linguistic and aural-linguistic networks, and regarded it as a fundamental approach. In any case, it appeared to produce impressive results.

Finally, an exploratory study reported by the present writer, David B. Orr, (3), has also suggested the importance of simultaneous input of aural and visual information. In this experiment, subjects read silently while a special device presented the same text aurally, without pitch distortion, 375-475 wpm, well above the average reading rate of the group. The Nelson-Denny Reading Test was used before and after training. Experimental subjects had no difficulty in keeping up and showed a significant, post-experimental mean increment in reading rate of 90 wpm; this increment was significantly greater than the control group increment (10wpm) at the one per cent level. This increment was accomplished with no loss in comprehension score and a significant increment in vocabulary score as compared to both initial score and control increment.

In summary, the above-cited research seemed to suggest that simultaneous presentation of material via both auditory and visual channels

may have a facilitating or an interfering effect on informational transmissions depending on the rate of presentation, the degree of similarity and complexity of the two stimuli, and the continuity and meaningfulness of the material.

The present research was undertaken to examine the possibility that bimodal presentations might enhance the comprehension and retention of content of EMR's, a group that traditionally has extreme difficulty not only in learning to read, but perhaps more importantly reading to learn.

Procedures

The experiments were carried out at a public special education school in the Montgomery County, Maryland system. As the present paper is concerned only with the retention phase of these experiments, only procedures relevant to that phase are discussed below.

Subjects

Subjects were selected who had recorded (individual test) IQ's between 54 and 86; ages between 12 years, 11 months and 17 years, 11 months; reading grade level of at least 2.0; and no major auditory or visual defects or known degenerative neurological diseases. Subjects were of both sexes

and predominantly white. They were randomly assigned to the various treatment groups used in the experiment.

Materials

Materials consisted of three 600-700 word passages developed and adapted by Spicker (4). These passages were rated at grade levels 3, 5, and 9, respectively. Twenty four-choice multiple choice tests of appropriate difficulty were developed for each passage.

Treatment Groups

Four groups of subjects were constituted:

1. A Machine-Audio-Visual (MAV) group, exposed to bimodal presentation of the three passages. Tape recordings slowed by 20% (to about 80wpm) by means of a device which can vary rate without pitch distortion were used for the auditory presentations; 14-point macrotype was used for the same material to be read.

2. A Teacher-Audio-Visual (TAV) group, also exposed to bimodal presentations, with the audio portion produced by the teacher reading at his normal speed.

3. A Machine Audio (MAud) group, which received the slowed auditory taped presentation but no reading material.

4. A Control group which did not receive the passages, but only the questions.

There were not sufficient subjects available for Teacher Audio or Hawthorne control groups. The rates of presentation used were selected on a priori grounds after pilot testing as being "appropriate" in each case. They were not under experimental investigation in this phase of the study.

Experimental Method

The three passages were administered, one each day on successive days, in ascending order of difficulty to each of the three treatment groups. They were presented in accordance with the type of treatment prescribed for the group (MAV, TAV, or MAud). After each passage its 20-item test was administered, and the tests only, without the passages, were given to the control group. All tests were given using both the reading and listening modes.

As measures of retention, the "odd" test items were re-administered without the passages after about one month, and the "even" items re-administered after the second month. As before, these tests were presented on three successive days. Immediately after the collection of the second retention measure, the passages were again presented and all 20 questions again administered to supply a re-learn index.

Data collection efforts for this phase of the study had to be limited in time in order to permit carrying out of an instructional experiment which took up the time between the initial and final retention testing. Make up sessions were limited to within one calendar week from the group testing. As a consequence, there was a differential N in each of the groups, and, in general, the analyses were simplified by equalizing the N's in each of the cells of the analyses of variance to N = 8 by randomly casting out the excess cases.

Results

Tests showed in general that the treatment group means significantly exceeded the control group mean, thus indicating, as expected, that the scores were a function of knowledge gained from the passages. (It will be remembered that the control group did not receive the passages.) An analysis of variance was done based on the initial score data shown in Table [redacted]. This analysis clearly showed that the two subtests (odds and evens) were not different, at least with respect to initial score data. It may be safely presumed that they were not different for other administrations, and the absence of interaction between split and treatment suggested that the two subtests were appropriate for the comparison of treatments.

Table 1

Means and Standard Deviations by Odd and Even Items, Treatment Groups, and Passages for Initial Comprehension Data, Retention Phase

Difficulty (Passage)		Control		MAV		TAV		MAud	
		Even	Odd	Even	Odd	Even	Odd	Even	Odd
3	($\bar{X}$)	3.8	3.6	7.5	7.6	5.2	5.8	5.8	6.0
	(s)	.88	.92	2.07	2.07	1.28	1.39	1.91	2.27
5	($\bar{X}$)	3.3	3.3	6.6	5.7	6.0	5.1	4.0	4.2
	(s)	1.17	.88	1.60	1.98	1.60	2.30	2.07	2.19
9	($\bar{X}$)	2.0	3.0	5.1	5.1	4.6	5.2	3.0	3.1
	(s)	.93	.75	2.10	1.46	2.26	2.66	2.45	2.03

Note.-- Each entry is based on N=8; data is based on 10-item tests. The Control group did not receive the passages and thus represents a baseline estimate.

As expected, the Grade 3, 5, and 9 passages proved highly detectably different in difficulty. However, a treatment effect was also detected at the 10% level (the level chosen for significance for the entire experiment on several a priori grounds), with MAV > TAV > MAud being the order of the means. Further analyses of the treatment effect were suggested by the treatment by difficulty interaction. Analyses of the simple main effects confirmed the treatment difference at the 10% level or better for each of the three difficulty levels. The means were in the order given above for the Grade 5 and Grade 9 passages and MAV> MAud> TAV for the Grade 3. Not all mean differences reached significance, however, the significant ones were as follows: Grade 3, MAV > TAV, MAud; Grade 5, MAV > MAud; Grade 9, MAV, TAV >MAud.

Having demonstrated that the odd-even subtests were equivalent, the retention data themselves could then be analyzed. The average of the odd-even scores was taken at the initial treatment group, by difficulty (passage). Thus, these analyses were based on 10-item tests or equivalent. The means are shown in Table 2. The purpose of this comparison was to determine whether or not there were significant differences in score after the two intervals of time, and whether or not difficulty and initial treatment differences persisted.

Table 2

Means and Standard Deviations by Retention Interval, Difficulty and Treatment Groups (Cell Ns=8)

Difficulty (Passage)		MAV			TAV			MAud		
		R_0	R_1	R_2	R_0	R_1	R_2	R_0	R_1	R_2
3	$(\bar{X})$	7.6	6.5	6.4	5.5	6.0	4.8	5.9	5.8	4.0
	(s)	1.76	1.14	2.26	1.20	1.85	1.28	1.90	1.28	1.85
5	$(\bar{X})$	6.2	5.2	5.0	5.6	5.9	4.9	4.1	4.8	4.6
	(s)	1.42	2.19	2.20	1.68	2.95	1.73	1.86	1.28	2.82
9	$(\bar{X})$	5.1	4.4	4.1	4.9	4.0	3.8	3.1	3.6	3.2
	(s)	1.73	1.51	1.36	2.38	2.67	1.49	2.13	1.41	1.58

Note.-- Data is based on 10-item tests, where R_0 is the average of initial odd and initial even scores.

The differences in initial treatment did not hold up over the retention intervals, although the overall differences in the means remained in the same direction. Mean differences by difficulty level were again highly significant. Mean differences at the retention intervals were also significant and in the anticipated direction: initial > one month > 2 months. These analyses suggested that the favorable effects of bimodal presentation were decreased over the retention intervals, but that the bimodal procedure did not adversely affect retention. In other words, the results may be interpreted as a case of the regression of the high groups toward the common mean, across time.

A further measure of retention was obtained by re-administering the passages to the three treatment groups, using the original presentation mode, two months after initial exposure. The data are summarized in Table 3. The analysis of variance showed significantly higher mean scores for the relearning condition than for the initial data. The ANOVA again revealed no differences by treatment group and highly significant differences by difficulty level in the expected direction. However, the nearly significant treatment by test interaction suggested that the initial vs. relearning increase be examined by treatment group. In an analysis of simple main effects this difference was found to be significant for TAV and MAud, but not for MAV. A similar analysis showed that while the means remained in

Table 3

Means and Standard Deviations for Relearning

by Difficulty and Treatment Group

Difficulty (Passage)		MAV		TAV		MAud	
		RL_0	RL	RL_0	RL	RL_0	RL
3	$(\overline{X})$	15.1	15.4	11.0	14.4	11.8	13.1
	(s)	3.52	4.00	2.39	2.50	3.81	4.09
5	$(\overline{X})$	12.4	13.2	11.1	13.1	8.2	11.9
	(s)	2.97	5.09	3.36	3.56	3.73	5.17
9	$(\overline{X})$	10.2	12.1	9.9	11.6	6.1	9.4
	(s)	3.45	4.82	4.76	4.53	4.26	4.41

Note.--Cell Ns=8; data based on 20-item tests.

the order MAV> TAV> MAud, the significant difference obtained on the initial test did not hold up on the relearning test.

Thus it would appear that the second administration of the passages produced scores at a significantly higher level than the original administration in spite of a two-month interval between administrations. It should be noted, however, that the two-month interval contained 30 instructional periods in which the experimental treatments were used with other materials. The demonstrated increments could thus be attributed to relearning or treatment effects, or probably, both. In any case, these findings emphasize that EMRs <u>can</u> profit from suitable learning experiences. The failure of the MAV increase to reach a significant level was again probably due to a regression effect of the highest score level toward the common mean.

A final question which was investigated with these data was whether or not the scores obtained after an interval differed significantly from a chance level. Relevant information can be had by comparing the scores for the treatment groups after one month to those obtained by the control group (which did not receive the passages at all) for the same (odd) items. The relevant means are contained in Tables 1 and 2.

In the analysis of variance, a highly significant difference in the group means was detected. Examination of the means themselves

showed that this difference arose because all treatment group means significantly exceed the control group mean, thus suggesting strongly that some of the material was retained by the treatment groups over the interval of one month. Again a significant difference in difficulty was noted.

Although statistical interdependencies precluded a test at the two-month interval, it seems safe to say that EMRs demonstrated a significant capacity for the retention of instructional material over a considerable time span. Means at the two-month interval were in the same direction. This finding may be one of the more important of the study as it indicates the value of continued effort to improve instructional techniques for the EMR.

Summary and Discussion

To summarize the retention phase of the study, significant retention was obtained after a one-month interval (and probably after a two-month interval) as compared to a control baseline that did not receive the passages. Significant losses with time were also detected, as expected, by comparison with initial scores. The initial differences in the treatment group means in the direction MAV > TAV > MAud did not hold up across the retention interval. A significant improvement over initial score was found on a re-learning exercise carried out after a two-month interval, particularly for the TAV and MAud groups. Difficulty levels were significant in all analyses

in the expected direction. It was concluded that EMRs are capable of retaining and of significantly profiting by relearning for the instructional materials used; and that the initial treatment group differences tended to regress toward a common mean over time.

It is not possible to come to any definitive conclusions on the matter of sensory facilitation on the basis of this small study, though it seems quite clear that the simultaneous sight/sound procedures did not produce an interference effect on retention. Indeed, the persistent tendency for the means to favor the bimodal presentation groups, not only in the phase of the experimentation reported here, but in the instructional phases of this experiment not reported here, suggests strongly the need for further research with a less specialized and more generalizable population to determine the potential value of bimodal presentation for educational communication.

REFERENCES

1. Heckelman, R. G. A Neurological Impress Method of Reading Instruction. Merced County Schools, California, March 1964. (unpublished)

2. Hernandez-Peon, R., Scherrer, H. & Jouvet, M. Modifications of electric activity in cochlear nucleus during "attention" in unanesthetized cats. Science, 1956, 123, 331-332.

3. Orr, David B. Recent Research on Reading and the Comprehension of Time-Compressed Speech. College Reading Association, Vol. 17, Easton, Pennsylvania, 1966.

4. Spicker, H. Listening comprehension and retention of intellectually normal and retarded children as a function of speaking rate and passage difficulty. Unpublished doctoral dissertation. Nashville, Tennessee: George Peabody College for Teachers, 1963.

5. Stromer, W. F. An Investigation into some of the Relations Between Reading, Listening, and Intelligence. Ph. D. thesis, University of Denver, 1952. Abstract: Speech Monographs, 1954, 21, 159-160.

6. Travers, Robert M. W. On the Transmission of Information to Human Receivers. (Based on Contract C-997, U. S. Office of Education, Educational Media Branch) 1964. (unpublished)

7. Van Mondfrans, A. An Investigation of the Interaction Between the Level of Meaningfulness and Redundancy in the Content of the Stimulus Material, and the Mode of Presentation of the Stimulus Material. M.A. thesis. University of Utah, 1964.